

# **ACTION TEAM PROGRESS REPORT**

## **Recovering the Value of Waste for Environmental and Energy Sustainability**

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### **Team Membership:**

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### **Environmental Problem:**

Two significant environmental problems lead us to explore the environmental benefits of using waste as a source for energy:

First, municipalities, hospitals, industry, food processing plants, farms, and disaster response entities are all challenged with the sustainable management of wastes and residues. Our society has increasingly generated more waste per capita. In addition, as our consumer products become more technically advanced, technical challenges of managing the resulting wastes also increase. The 1.4 Billion Tons of wastes and residue materials that the U.S. produces every year impacts air and water quality, decreases land values, limits future use of land, and increases costs to municipalities, universities, industry, hospitals, food processors, farms, and ultimately the consumer. This is particularly exacerbated in geographic areas experiencing rapid population growth and industrial productivity. Some sectors have unique waste management problems for which the current waste infrastructure does not readily address. Several of these waste related problems were identified in response to EPA's Environmental Technology Council solicitation, such as residues from meat packing and confined animal feeding operations. More recently, in the aftermath of Hurricanes Katrina and Rita, it is clear that current infrastructures are barely able to handle catastrophic quantities of benign disaster debris, let alone debris containing hazardous, toxic, recalcitrant or infectious agents. The Department of Homeland Security has begun to

identify the ability to manage debris resulting from catastrophic events (natural or man-made) as a critical function for national preparedness. Several technologies capable of converting waste to energy hold promise for addressing many of these problems, given their ability to break down complex compounds into, oftentimes, less toxic compounds, through thermochemical, physiochemical, and biological manipulations.

The second challenge lies with our increasing demand for primary energy leading to the depletion of natural resources, the degradation of ecosystems, and generation of significant amounts of solid waste, water pollution, and atmospheric pollution. With U.S. consumption of primary energy increasing at an annual average rate of 2.4%, we will continue to see increasing rates of pollution and environmental degradation, if new technologies are not pursued. The production of energy products permanently consumes coal, natural gas and petroleum resources. The Energy Information Agency predicts that the U.S. domestic supply of natural gas will be exhausted in 50 years while the coal supply will be spent in 250 years. Conservation of these resources is prudent to assure future generations have a source of energy while alternative methods are developed to take the place of these resources in the production of goods and commodities. Residues materials generated in the United States have the potential for supplying 97 Quads of clean domestic renewable energy for use in the United States. Given the chemical and energy value and significant volumes of waste generated per year, we are literally throwing away a significant source of much needed energy. The recovery of this untapped source of energy can have a significant impact on the development of sustainable energy production in the United States. A key challenge, however, is to ensure that our rush to produce new sources of much needed energy is cleaner than current energy sources, and not impairing water and air quality, land use and availability, and resources for future generations.

These two trends, combined, present both challenges and opportunities. Waste conversion technologies may hold both a waste management and alternative energy solution, along with other challenges facing the U.S. today, including: 1) our dependence on foreign energy sources and subsequent security issues; 2) development of technologies that aid in transitioning to a hydrogen energy economy; 3) the introduction of technologies that can respond to future legislation constraining the release of carbon oxides, and 4) the enhancement of rural power production.

**Technology Challenges:** A variety of technologies are being developed to convert various kinds of wastes into heat, power, fuels, or chemical feedstock. Although there are many concepts and pilots being developed, relatively few technologies are commercially available to date in such proportion as to effect long-term economic, structural and behavioral changes. It is important to understand the technical and economic feasibility of these technologies, along with their environmental performance to move them towards commercialization.

There are individual technical challenges related to feedstock, conversion technologies, and energy product distribution, as well as their relationship as components of a larger conversion system. The entire system will need to be technically, economically, and environmentally sound for it to be successfully commercialized. Given the intense investment in new energy technologies that is expected in the next few decades, and the number of years this new technology infrastructure will be in service, it is essential to understand the full life-cycle environmental impacts of these systems.

Understanding the stage of development a technology has reached and identify existing barriers for moving towards commercialization will help identify whether the focus

should be on primary research, demonstrations, verifications, or commercialization of a particularly conversion system.

**FY'06 Accomplishments:**

- Secured money through the Environmental and Sustainable Technology Evaluations (ESTE) program to verify co-firing of solid biomass with coal in boilers. Endorsement by OSW, OAR, ORD, OAQPS, and USDA. Verification protocol is underway.
- Developed catalog of all feedstocks, conversion technologies, and energy products organized by thermochemical, physiochemical, and biological methods. Currently being reviewed by experts within and outside EPA. Plans to post this catalog on ACORE's 'wiki'. Strong endorsement from ACORE, Environmental Defense, USDA, DOI.
- Organized Mississippi Biomass Summit with Region 4 & OSW to develop implementation plan for greater utilization of woody biomass waste resulting from Hurricane Katrina in MS. Working with MS Office of Economic Development and MS State University to identify further research and development opportunities in MS. Project has been incorporated into EPA's Stewardship Action Report.
- Working with Region 6, OAQPS, OECA, OGC, ORD, State of Louisiana to develop alternative method for use of asbestos containing material as an alternative fuel. Test protocol will be developed by industry, and reviewed by ORD to determine whether to approve by OAQPS and others in EPA.
- Working with DHS/FEMA/USACE on identifying technology and environmental capabilities needed as part of a preparedness plan for managing disaster debris.
- Helped obtain supplemental funding for ORD/NRMRL to construct a biomass gasification structure (at RTP) in partnership with the Italian Ministry of Environment.
- Led a 'mini-team' on conversion of agricultural waste to energy to frame discussion for EPA's Innovations Action Council
- Organized a Workshop in partnership with OSW to discuss Waste to Energy issues as part of OCFO's 'Futures' Workshop
- Incorporated the issue of waste to energy into EPA's draft charge to the National Advisory Council on Environmental Policy & Technology (NACEPT) to explore role of EPA
- Region 6 developed GIS Decision Tool to help identify available feedstocks and infrastructure for WTE conversions.
- Became part of Federal inter-agency workgroup, "Woody Biomass Utilization Workgroup" that reports to Under Secretaries in USDA and DOE; EPA sponsored the first substantive inter-agency dialogue meeting on conversion technologies and environmental requirements. EPA invited to co-chair WBUG next Fiscal Year.
- Provided information to Region 2 on waste to energy conversion technologies to help Puerto Rico identify waste management options after landfills are closed.
- Developed FY '07 Budget Initiative on disaster debris treatment technologies that included waste to energy options.

## **FY'07 Objectives:**

- Complete catalog of technologies, post on ACORE's 'wiki' and have public populated data such as:
  - Number of conversion technology types, location, kinds of wastes for which technical feasibility has been verified, etc.
  - Add a GIS component to the catalog of technologies, including identify wastes that have the potential to be used as fuel, including geographic predominance, annual generation rates, and collection infrastructures.
  - Develop a sustainability indicator for specific technologies
- Encourage ORD to perform Life-cycle analyses on predominant, emerging waste to energy technologies
- Identify environmental performance (e.g., emissions to air, water, waste residuals, etc.) of these technologies and compare them with similar technologies using non-waste fuels, as well as comparing them with other waste treatment technologies
- Identify industries/sectors that could benefit from waste to energy technologies
- Quantify potential energy savings/conservation by employing waste to energy technologies.
- Identify EPA's unique and collaborative roles in mitigating barriers for these technologies to help solve stated waste and energy problems.
- Identify specific state, industry, regional interest in waste to energy.
- Work with IAC Agriculture Team and AgSTAR to encourage manure conversion
- Work with IAC Fuels and Energy discussions to ensure waste to energy is included as an option.
- Work with NGOs, other federal agencies, and EPA offices/regions on understanding environmental impacts of conversion technologies, particularly related to biomass and wastes.

## **Issues:**

- **Staffing & extramural funds** – The Team Leader leverages opportunities, staff and funding as it arises, but there is no strategic plan or commitment of funds to carry out objectives.
- **No formal recognition of this as part of job role**
- **No detailed reporting back to management on accomplishments or followup actions that are needed.**